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ABSTRACT

The impact of college on vocabulary and mathematics achievement test scores was studied. Identical tests were administered to students before they left high school and 7 years after high school graduation. The research design controlled for socioeconomic background and initial ability levels as measured in high school. Analyses for blacks and whites were included to determine the differential impact of college attendance for the two groups. Study data were drawn from the National Longitudinal Study of the High School Class of 1972, and were based on scores of 1,738 white students and 451 black students. It was found in general that knowledge of vocabulary increased after high school, while knowledge of mathematics declined. Postsecondary educational experience, however, tended to enhance performance in both vocabulary and mathematics. On the average, a college graduate scored about one-half standard deviation above those who did not attend college. Finally, the results indicate that the impact of college was similar for whites and blacks. Additional findings include the following: those respondents from high socioeconomic status families generally scored higher on the achievement tests; and whites tended on the average to achieve higher scores on the tests than did blacks. (SW)

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EFFECTS OF HIGHER EDUCATION ON ABILITY FOR BLACKS AND WHITES

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ABSTRACT

This study assesses the impact of college on knowledge of vocabulary and mathematics. Unlike many previous studies, this one is able to control for pre-college abilities in these academic areas, which presumably tend to select people into or out of college. The results indicate that college attendance has a strong impact on improved performance on these tests, and that these effects are similar for whites and blacks.

EFFECTS OF HIGHER EDUCATION ON ABILITY FOR BLACKS AND WHITES

Despite numerous studies of the effects of higher education, we still do not know a great deal about the impact of college on the intellectual skills of students. There is evidence that college students further develop intellectual skills during their college careers (e.g., Astin, 1977), but it is not clear whether these changes occur as a consequence of college attendance or as a consequence of simple maturation. There is also evidence that college students score higher on achievement tests than do others of their cohort who did not attend college (Feldman and Newcomb, 1969; Pace, 1979), but it is not clear whether these differences are a result of college attendance or an artifact of a priori differences in the kinds of people who do and do not attend college. It is also clear that adults who attended college know more than those who did not (Hyman, Wright, and Reed, 1975); what is not clear, however, is whether those who attended college were those with higher ability scores to begin with, or whether college attendance itself produced increments to knowledge. (For example, Wolfle [1980] has shown that previous studies may have seriously overestimated the enduring effects of education by failing to control for a priori measures of ability.)

Adequate research on the impact of college should therefore control for the different characteristics of those people who do and do not attend college. In particular, the different levels of ability between the

two groups needs to be controlled. In addition, tests of intellectual skills should be used that are not focused specifically on knowledge and skills taught in college; otherwise, comparisons of college with non-college attenders will almost assuredly lead to the tautological conclusion that college attenders know more about what is taught in college than do non-college attenders.

The fourth follow-up of the National Longitudinal Study of the High School Class of 1972 (Riccobono, et al., 1981) includes for the first time a readministration of academic tests that the subjects first took before they graduated from high school. These data uniquely permit the adequate measurement of the impact of post-secondary education. The present study examines the impact of post-secondary education on two academic tests of achievement, one in vocabulary and one in mathematics, administered seven years after high school graduation, while controlling for socioeconomic background and initial levels of ability as measured in high school.

The present study also includes analyses for both blacks and whites in order to determine the differential impact of college attendance upon the two groups. On the one hand, it may be that increments to measured ability are similar for blacks and whites, which one might expect if the pool of black college students was not unlike the pool of whites. On the other hand, for the same amount of post-secondary schooling it may be that blacks demonstrate larger increments to measures of ability than do whites. A plausible explanation for the latter may be that primary and secondary educational institutions do not

tap the potential of blacks in the same way they do for whites. When blacks attend college, the experience may serve to remediate these past deficiencies. Consequently, blacks would initially exhibit lower mean ability scores but after some college show greater gains than whites.

DATA AND METHODS

Data for this study were drawn from the National Longitudinal Study (NLS) of the High School Class of 1972 (see Riccobono, et al., 1981). The NLS was designed to provide data on a large cohort of high school seniors, and to follow these students as they made the move from high school into their early years of adulthood. The variables used in the present analysis include several socioeconomic background variables. Father's and mother's education were measured on a scale that ranged from 1 (less than high school) to 5 (masters or Ph.D.). Father's occupational status was scaled with Duncan's (1961) socioeconomic index. Increments in schooling beyond high school were measured on an ordinal scale on which values increased for both vocational and academic college attendance. Race was measured by a dummy variable in which 1 = white and 0 = black; other ethnic groups were omitted from this analysis.

The outcome measures included two test scores corrected for guessing, one a math test and the other a vocabulary test, which were administered in the homes of a random subsample of NLS respondents during the NLS fourth follow-up survey in 1979. The math test included questions that asked students to indicate which of two quantities was greater, or to assert their equality; there were 25 items in the test. The vocabulary test used a synonym format using words that

approximated a twelfth-grade level of difficulty; there were 15 items in the test. Identical tests were administered to the students in 1972 before they left high school, and their scores on the 1972 tests have been used as controls in the regression equations reported below. There were 2189 subjects included in these analyses, 1738 of whom were white and 451 of whom were black.

The analysis was completed by a regression approach to the analysis of covariance. The 1979 mathematics and vocabulary test scores were regressed on their respective equivalent test scores administered in high school, and four measures of socioeconomic background, including a dummy variable measuring racial group membership; also included as an independent variable in the regression was a measure of post-secondary educational attainment. To test whether the effects of socioeconomic background, prior ability, and post-secondary educational attainment varied between blacks and whites, cross-product variables were created (e.g., post-secondary educational attainment multiplied by the race variable) and added to the regression equation. If the addition of these variables adds significantly to the explanation of variance in the outcome measures, one should conclude that the effects of the independent variables on the 1979 measures of achievement were not the same for whites and blacks.

THE RESULTS

Table 1 presents means, standard deviations, and correlations for the variables in the analysis. Examination of the means reveals that the average performance on the vocabulary test increased about 2.5 points

between 1972 and 1979. In contrast, the math test scores decreased by about 1.3 points. It appears for the sample as a whole that knowledge of twelfth-grade vocabulary words increased after high school graduation, while knowledge of mathematics decreased. The correlations show that all of the predictor variables are positively related to vocabulary and mathematical skills. These indicate that those respondents from families of higher socioeconomic status generally scored higher on the achievement tests. The positive correlation between the test scores and race merely indicates that whites tended to score higher on these tests than did blacks. The best zero-order predictors of the achievement tests given in 1979 appear unsurprisingly to be the same measures taken in 1972.

Insert Table 1 About Here

Table 2 presents the results of the regression of the 1979 mathematics and vocabulary tests on six independent variables. These results clearly show, and without surprise, that the best predictors of the 1979 test scores were the scores of the same tests administered in high school; those people who did well on the tests in high school continued to do well seven years later. Among the background variables, only father's education had significant effects upon test performance in 1979, controlling for the other variables in the equation. For both vocabulary and mathematics, whites tended on the average to achieve higher scores on the tests than did blacks.

Insert Table 2 About Here

The major findings revealed in Table 2 relate the acquisition of post-secondary schooling to performance on the two measures of achievement. The regression coefficients relating post-secondary educational attainment to achievement are both positive, significant, and strong. For each increment in post-secondary schooling (for example, those who completed some vocational training versus those who completed no schooling beyond high school, or those who completed more than two years of college with some additional vocational training versus those who completed more than two years of college with no additional vocational training) the 1979 vocabulary test score increased on the average .35 points, while the 1979 mathematics test score increased .49 points. These are not trivial gains, for they indicate that those students who completed a four- or five-year degree program scored on the average 2.48 points higher on the vocabulary test than those respondents who only completed high school. Similarly, college graduates scored an average of 3.41 points higher on the mathematics test than non-college attenders. For both tests, these differences represent about one-half standard deviation on the 1979 test scores.

To test whether blacks received the same increments in vocabulary and mathematics achievement in return for post-secondary schooling (and other independent variables) as did whites, interaction terms were added to the regression equations reported above. If these additional variables

significantly increase the explained variance in the 1979 test scores, then one should conclude that there were interactions between race and the other independent variables. These interactions, however, were not significant. The coefficient of determination for the vocabulary test increased from .589 to .592 with the addition of five interaction terms, while the coefficient for math increased from .662 to .663. That is, blacks receive the same increments in vocabulary and mathematical achievement as a result of changes in the independent variables as do whites.

CONCLUSION

Unlike many previous studies on the impact of college, these analyses have been able to assess the effects of post-secondary educational attainment upon vocabulary and mathematical achievement while controlling for prior vocabulary and mathematical ability. The results indicate that, in general, knowledge of vocabulary increases after high school, while knowledge of mathematics declines. Post-secondary educational experience, however, tends to enhance performance in both vocabulary and mathematics.

These effects are strong and significant; nevertheless, they may understate the impact of college, because the tests used were general tests of what one might be expected to know as a high school senior, and may be insensitive to what is specifically taught in college. The advantage of these tests, however, is that fair comparisons may be made between those who go to college and those who do not, for the tests are not specific to knowledge presented in a college curriculum. In a loose

sense, therefore, these results have provided good estimates of the minimum effects of college. The results indicate for these tests that on the average a college graduate scored approximately one-half standard deviation above those who did not attend any college.

Finally, these results indicate that the impact of college is similar for whites and blacks. In one sense, the equal effects of college for the two groups is encouraging, for it indicates that the sizeable effect of college is just as available for blacks as it is for whites. In another sense, however, the results are discouraging, for they indicate that college attendance does not lead blacks to close the gap with whites in vocabulary and mathematics achievement. For that to happen, colleges would have to institute policy changes that lead to larger increments in knowledge for blacks than for whites. Whether or not such a policy would be beneficial for our society seems to be a moot point, for it seems unlikely on practical grounds ever to be adopted.

Table 1. Means, Standard Deviations, and Correlations Used to Analyze Effects of Higher Education, 1972 High School Graduates (N = 2189)

	VOC72	MATH72	RACE	FAED	MAED	FAOCC	EDATT	VOC79	MATH79
VOC72	1.00								
MATH72	.581	1.00							
RACE	.367	.392	1.00						
FAED	.320	.296	.244	1.00					
MAED	.299	.283	.139	.520	1.00				
FAOCC	.306	.292	.271	.569	.380	1.00			
EDATT	.390	.460	.061	.350	.320	.284	1.00		
VOC79	.735	.606	.381	.334	.291	.295	.443	1.00	
MATH79	.551	.799	.337	.314	.281	.277	.493	.604	1.00
Means	6.020	12.05	.794	2.222	2.138	39.82	3.780	8.522	10.72
Stand. Dev.	4.089	7.34	.405	1.198	1.053	23.15	2.337	4.481	7.41

Table 2. Regression Results of Vocabulary and Mathematics Performance on Social Background, Race, Prior Vocabulary or Mathematics Achievement, and Post-Secondary Educational Attainment

Independent Variables	Vocabulary		Mathematics	
	Metric*	Standardized	Metric*	Standardized
RACE	1.565	.141	.816	.045
	(.168)		(.257)	
FAED	.147	.039	.280	.045
	(.069)		(.104)	
MAED	.070	.016	.061	.009
	(.070)		(.105)	
FAOCC	-.001	-.007	-.004	-.012
	(.003)		(.005)	
VOC72	.653	.595	- - -	- - -
	(.018)			
MATH72	- - -	- - -	.704	.698
			(.016)	
EDATT	.355	.185	.487	.154
	(.030)		(.047)	
Constant	1.588		-.860	
R^2	.589		.662	

* Standard errors are shown in parentheses.

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